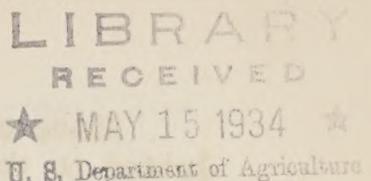


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MONTHLY LETTER OF THE BUREAU OF ENTOMOLOGY

UNITED STATES DEPARTMENT OF AGRICULTURE



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FIELD LABORATORY ACCOUNTS

How elaborate an accounting system should a field laboratory have? Some laboratories that conduct several lines of work have accounting books comparable to those in the Washington office. Others confine their accounting to an occasional notation on the back of an envelope. Obviously, the first practice is too elaborate and unwieldy for a small laboratory, while the second is unsafe for any. President Lincoln, when asked how long a man's legs should be, replied that they should be long enough to reach from his body to the ground. It would seem that the same common-sense policy should govern in connection with field laboratory accounts. They should be adequate to keep the responsible head informed as to the status of his available funds without burdening him with unnecessarily involved records. The following form, or some variation of it, has been used successfully by a number of the Bureau field laboratories:

Allotment Account

Station: Rome, Ga.

Appropriation: Fruit (Peach) Insects

Name	Article or service	Date of service	Date of voucher	Amount	L.A. balance
John Jones - L.A. 240	Orig. allotment	7-1-33	- - -	\$200.00	\$200.00
Rome Hardware Co.	Bldg. supplies	7-5-33	7-10-33	35.00	165.00
Black Drug Co.	Chemicals	7-20-33	7-29-33	10.00	155.00
Ralph Brown	July reim. acct.	8-1-33	8-1-33	110.00	45.00
John Jones - L.A. 240	Inc. in allot.	8-15-33	- - -	50.00	95.00
Ga. Power Co.	Electricity	8-20-33	8-25-33	4.50	90.50

Since most station heads are responsible only for the funds allotted to them under their Letters of Authorization, one of these accounts should be sufficient for each appropriation item under which funds are allotted to him. The proper maintenance of the account will enable him to tell at all times how much remains of his original allotment and to avoid the danger of over-drafts. If, in addition, to funds under his Letter of Allotment, he has been told that there will be held for his needs a certain portion of the Purchase Allotment of his Washington division, he can also keep a record of this allotment and thus know when he is getting close to the limit of the amount that has been reserved for him.

This suggested form is offered for what it may be worth. It can be varied in any way that will best meet the needs of a particular station. The important thing is not the form of the account but the necessity for keeping a record that will at all times enable the station head to know where he stands financially.

FRUIT INSECTS

Dark-colored bands capture more codling moth worms.--E. J. Newcomer and F. P. Dean, of the Yakima, Wash., field laboratory, have just reported the results of experiments with the codling moth bands, as follows: "In our report for December 1932 we stated that bands treated with beta-naphthol and oil caught 79 percent of the worms, as compared with 21 percent caught in untreated bands. We suggested that the darker color of the treated bands probably attracted a larger number of worms. In 1933, therefore, Mr. Dean saturated some of the banding material in the same oil used for treating bands, but with the beta-naphthol omitted. This darkened the bands, but it was found during the season that those oil-treated bands had more of a tendency to bleach out than those treated with oil and beta-naphthol. They had already been put in an orchard, however, in comparison with untreated bands. Of 1,159 worms caught, 56.2 percent were caught in the dark, or oil-treated, bands, and 43.8 percent in the light, or untreated, bands. This shows a preference for the dark bands, but one not so great as when the bands were treated with both beta-naphthol and oil. It is planned this season to dye the paper black in both the treated and untreated bands and then compare results."

Codling moth baiting materials.--The following is quoted from E. R. Van Leeuwen's report on bait-trap studies of the codling moth conducted at Yakima during 1933: "A total of 120 chemicals were used in tests to attract the adult codling moth. The method employed involved the use of a standard bait composed of a mixture of 1 part of molasses to 10 parts of water, with and without the test chemical. The chemical under test was floated on top of the standard bait by means of a small vial and cork known as the Peterson evaporating cup.

Many of the materials used attracted more moths to the standard bait than when the standard bait was used alone. The materials strongly attractive to the adult codling moth may be divided into 3 classes as follows:

"(1) Those which, when added to molasses bait in an evaporating cup, increased the number of moths caught by 300 percent or more over the number of moths captured in molasses bait alone. These included safrole, n-butyl sulphide, and pine-tar oil.

"(2) Those which increased the number of moths from 100 to 300 percent. These included citral, dinitrochlorobenzene, isoamyl alcohol, bergamot oil, valeric acid, n-butyl disulphide, beta-methyl naphthalene, ammonia, dinitronaphthalene, geraniol, cymene, mace oil, rosin spirits crude, aniseed oil, and 2.6 percent dichlorophenol.

"(3) Those materials which increased the number of moths from 50 to 100 percent. These included amyl sulphide, lemon oil, camphor oil, pyridine, n-butyl mercaptan, nicotine sulphate, propylene dichloride, creosote carbonate, fluorene, bitter almond oil, juniper berry oil, diphenylguanidine, amyl alcohol, paranitrochlorobenzene, dichloroethyl ether, horsemint oil, paranitrotoluene, eugenol, amylenic dichloride, and dimethyl aniline.

"The materials which strongly reduced the number of codling moths caught in a molasses bait by repelling the moths or masking or destroying the attractive property of the bait are peppermint oil, isobutyl anthranilate, origanum oil, coal-tar creosote, sage oil, 3.5 dinitro-orthocresol, elemi oil and linseed oil. In all tests the addition of nicotine sulphate to molasses bait reduced the number of females caught, and increased its attractiveness to males. A combination of molasses, bergamot oil, and nicotine sulphate was superior to any other combination of these materials in terms of numbers of moths caught. The standard trap was improved by suspending a quart bottle of water above the bait to replenish automatically the loss of water by evaporation. This addition to the trap not only maintained a constant water level near the top of the trap, but it also required about one half the attention and time to operate. It increased the catch of moths by 24.6 percent. In a series of tests with trees approximately 14 feet high, baits 17 feet from the ground captured more moths than did baits 14 feet from the ground. Baits 14 feet from the ground were far superior to baits 7 feet from the ground."

Oriental fruit moth parasite stocks freed of mites by exposure to low temperature and winds.--J. K. Holloway, of the oriental fruit moth parasite project at Moorestown, N. J., has worked out a simple and ingenious method of getting rid of mites in parasite material. He says: "For the past two seasons mites have been prevalent in cold

storage during the winter months and have multiplied to the proportions of a pest. This year a close check has been kept on their numbers. There has been no evidence as yet of mites attacking larvae but they do present a potential menace. Of the various methods that have been tried for keeping the mite population down, the most successful so far has been the occasional exposure of the insect material to out-door conditions. The best time for such exposure is when the temperature is below 50° F., with a strong wind blowing. Under such conditions mites usually disappear after 2 days. Our stock has had one such exposure this winter, and the mites are at present very scarce."

Liberations of oriental fruit moth parasites in 1933.--H. W. Allen, Moorestown, has submitted a detailed report of the liberations of oriental fruit moth parasites, chiefly of Japanese origin, during 1933. These data are summarized in the accompanying table. In addition, the Bureau of Entomology supervised the collection of certain native parasites in New Jersey and their shipment to, and colonization in, Massachusetts and South Carolina. Except for supervision, the expenses were carried entirely by the local fruit growers' organizations.

Liberations of oriental fruit moth parasites, 1933

Species	Origin	States	Coun-	Colo-	Individ-
		in which liber-	ties in liber-	nies which liber-	uals liber-
		liber-	ated	ated	ated
Phanerotoma grapholithae	Japan	13	34	98	11,074
Diocles molesta	Japan	13	37	87	13,808
Perisierola angulata	Japan	8	17	48	12,186
Macrocentrus aenylivorus	U. S.	4	8	27	5,810
Macrocentrus thoracicus	Japan	8	15	22	5,998
Orgilus longiceps	Japan	4	4	4	422
Apanteles spp.	Japan	2	2	2	191
Elodia flavipalpis	Japan	2	2	2	143
Gambrus stokesii	Australia	2	2	2	91
Bassus diversus	Japan	2	2	2	78
Cremastus spp.	Japan	2	2	2	83
Pristomerus vulnerator	Japan	2	2	2	44
Glypta rufiscutellaris	U. S.	1	1	1	210
Total			299		50,138

Overwintering of the raisin moth in a vineyard.--Perez Simmons, of the Fresno, Calif., laboratory, reports: "Working in a vineyard of Zante grapes (currants) where the infestation by Ephestia figulilella Greg. was exceptionally heavy, apparently because much waste fruit was on the ground, H. C. Donohoe obtained information about the locations in which larvae of this insect pass the winter. By examination of soil samples with the treadle sifter, and of the bark on grape trunks, the relative concentrations of larvae in strips parallel to the rows of vines was obtained, as follows:

Average infestation in 1-square-foot samples of soil

Location and description of samples	Date of examination	Larvae taken
(1) Each sample including a vine trunk	Nov. 6-11 Nov. 28-Dec. 6	^a 53.2 48.9
(2) Taken under wires supporting vines, excluding areas in (1)	Nov. 6-11 Nov. 28-Dec. 6	20.4 22.1
(3) Taken on either side of strips which included (1) and (2)	Nov. 6-11 Nov. 28-Dec. 6	11.2 11.8
(4) Taken on either side of the strips which included (3) .	Nov. 6-11 Nov. 28-Dec. 6	0.7 4.9

^a Including average number taken under the bark of vines."

JAPANESE AND ASIATIC BEETLES

Immature stages of Jap beetle in the soil.--In connection with the regular seasonal soil surveys conducted by H. Fox, Moorestown, N. J., it is of interest to note that one egg and four first-instar larvae were found close together in a digging at the Tavistock Golf Course in Haddonfield, N. J., on January 26. The larvae have been definitely identified as Popillia japonica Newm., and, insofar as it is possible to determine by close examination, the egg appears to be of the same species. The egg was transferred to an incubator but failed to hatch, which is in accord with experiments conducted in 1930, indicating that eggs exposed for more than a month to temperatures below 55° F. are killed.

Depth of hibernation of scarabaeid larvae.--In order to compare the normal depth of hibernation of larvae of P. japonica with that of native scarabaeid larvae, Mr. Fox conducted surveys in January at two localities characterized by radically different types of soil. It is of interest to note the variation in the hibernation depth of different native scarabaeid larvae found in more or less close association with P. japonica. The first locality selected was the golf course near Concordville, Delaware County, Pa. The soil here, a derivative of the underlying gneissic rocks, was a very heavy clay loam of a deep red color and containing numerous angular stony fragments. At this place, four trenches were dug, each 3 feet long and 2 feet wide. Two of these were dug to a depth of 40 inches, the other two to 30 inches. No larvae of any kind were encountered in these below 20 inches. Larvae of the Japanese beetle were not found below 6 inches, but those of Phyllophaga, of which from 4 to 5 different forms were represented, were traced to 20 inches, though only a single individual was encountered below 15 inches. Of a total of 124 Phyllophaga larvae obtained, 17 percent occurred above 5 inches, 72.6 percent between 5 and 10 inches, 9.6 percent between 10 and 15 inches, and 0.8 percent between 15 and 20 inches. Two adults were obtained, one Phyllophaga inversa Horn at 5 inches, the other Phyllophaga hirticula Knoch at 20 inches. The survey at this place was made on January 16.

The second locality, where a similar survey was conducted on January 20, was the Asbury Park Golf Course at Hamilton, Monmouth County, N. J. The soil here was a light sand or sandy loam, pale gray near the surface, becoming darker and heavier with increase in depth. Small rounded pebbles were scattered through the soil, but were not numerous. Four trenches were also dug here, two to 40 inches, one to 35, and one to 30 inches. The first two were dug on high ground where drainage was good and the water table deep, the other two in relatively low ground where the water table was close to the surface. One of the trenches on the higher ground was dug at a spot where cuttings from the greens had been dumped earlier in the year, but from which they had been removed long before the digging was made. This trench yielded large numbers (290) of larvae of Cotinis nitida L., but no other form of Scarabaeidae. The greatest depth reached by these was 33 inches. The percentages found at various depths were roughly as follows: 1-5 inches, 4.5 percent; 5-10 inches, 18.5 percent; 10-15 inches, 31.5 percent; 15-20 inches, 30 percent; 20-25 inches, 11.5 percent; 25-30 inches, 3 percent; below 30 inches, 1 percent. In the second trench, which was dug nearby, but in ground which had not been covered at any time by extraneous material, larvae were much scarcer, only 19 being obtained, of which all represented Polyphylla, except three which were Cotinis. The greatest depth at which Polyphylla was encountered in this digging was 30 inches. None were found above 10 inches but they were rather uniformly distributed from that depth down to 30 inches.

Of the two lowland trenches dug at this locality, one was at a slightly higher level than the other and was characterized by a much lighter and more sandy soil. In this trench larvae were traced down to 25 inches, in the other not below 20 inches. Both trenches combined yielded 32 larvae, of which 2 were Japanese beetle (not below 7 inches), 17 Polyphylla, 8 Ochrosidia, 5 Phyllophaga, and 1 undetermined. Polyphylla larvae were found at depths of 10 to 25 inches; Ochrosidia, from near the surface to 10 inches; and Phyllophaga, from 5 to 20 inches. The latter obviously represented a type distinct from any of those found at Concordville.

Repellents to prevent feeding by adult Jap beetles.--A report entitled "Field Tests Conducted During 1933 to Increase the Adhesive Power of Hydrated Lime When Applied in Spray Form on Peach and Apple Foliage," by F. W. Metzger, was completed during the month. The summary of this report follows: "Boiled linseed oil at the rate of 1/2 pound and hydrated lime at the rate of 20 pounds to 100 gallons of water remained slightly longer on the foliage than did lime alone at the rate of 32 pounds to 100 gallons of water. Five applications of all combinations tested were necessary to protect foliage of Kummel and Iron Mountain varieties of peaches and Rome Beauty apple. Five applications did not entirely prevent injury to the foliage of Star apple trees. This number of applications is too many for the average grower to make and it is quite probable that fewer would suffice during a summer when the rainfall was less."

Increasing the effectiveness of lead arsenate as a stomach poison against the adult Jap beetle.--A report by F. W. Metzger entitled "Lead Arsenate Combined with Various Attractive Sprays" was completed during the month. A summary follows: "Syrline in combination with green or coated lead arsenate sprayed on apple foliage with a geraniol dispenser located in the tree gave the highest beetle mortality of all the poison-attractive combinations tested during the summer of 1933. Syrline, however, can not be used on apple foliage at the recommended rate without very serious injury after the first application. The vaporization of geraniol from a dispenser of the type described is a much more satisfactory method of employing the attractant than by applying it as a spray. Green lead arsenate applied with a dispenser is apparently no more attractive than coated lead arsenate when the latter is also used with a geraniol dispenser. Powdered lead arsenate with flour or fish oil as an adhesive can be substituted for the coated lead arsenate which, with a geraniol dispenser, appears to be the cheapest and most effective method of inducing beetles to feed on poisoned foliage."

D. J. Caffrey transferred to Division of Truck Crop and Garden Insects.--D. J. Caffrey, Senior Entomologist, has been transferred from the Division of Cereal and Forage Insects to fill the vacancy created by the transfer of Dr. P. N. Annand. Mr. Caffrey graduated from Massachusetts State College in 1909. He pursued graduate studies until 1910, when he accepted a position with the Connecticut Agricultural Experiment Station to take charge of gipsy and brown-tail moth investigations in that State. He entered the Bureau of Entomology in 1913 and was engaged in work on the range caterpillar, the wheat straw worm, the alfalfa seed chalcid, and, at Hagerstown, Md., on wireworms. Since April 1918 he has been in charge of research work on the European corn borer at Toledo, Ohio.

Euxnodos sp., on peppers causing no appreciable injury.--F. S. Chamberlin, of the Quincy, Fla., laboratory, reports as follows: "On January 15, investigations of a weevil, Euxnodos sp., which had been reported as causing serious injury to peppers, were conducted in Dade County. A survey of the very limited pepper acreage now being grown in this county has shown infestation in only one small garden patch. Injury is produced by the larva, which bores through the stem, causing the plant to break off, or wilt. The fruit is not attacked. The injury has evidently been confused with a stem-rot disease of peppers. The weevil, which was first observed in this county in 1927, has evidently been there longer, but has caused no appreciable injury to peppers except in the 1930 crop. It does not attack Irish potatoes, tomatoes, or other cultivated crops so far as the writer can determine. It has not been found on wild peppers or any other wild host plant to date. A search for wild hosts is being continued."

Results of experiments with insecticides against Mexican bean beetle and onion thrips.--Experiments conducted during 1933 by L. W. Brannon, at Norfolk, Va., on the Mexican bean beetle (Epilachna corrupta Muls.) and onion thrips (Thrips tabaci Lind.) indicated the following: The addition of nicotine sulphate to magnesium arsenate increased yields. Calcium arsenate in combination with nicotine sulphate reduced yield 100 percent, but only 2.7 to 3.7 percent when lime was added. It therefore appears that lime is a good corrective for reducing injury from calcium arsenate. Yields were increased when nicotine sulphate was added to cryolite, potassium hexaflu-aluminate-lime, and barium fluosilicate. Practically all dusts reduced yields, apparently because of failure to control thrips. Increases in yield are due apparently to thrips control, although no differences were observed between thrips injury on check and treated plants. The application of contact insecticides alone increased yield. Foliage injury in the form of leaf discoloration occurred after the third treatment on all plots to which nicotine sulphate was applied, either alone or in combination, although the injury appeared not to affect the yields.

Loss in weight of tobacco from infestation by tobacco moth and cigarette beetle.--W. D. Reed, of Richmond, Va., reports as follows: "In order to obtain data on the probable loss in weight of Turkish tobacco as a result of the feeding of Ephestia elutella Hbn., and Lasioderma serricorne Fab., samples of tobacco were obtained on January 18 from two heavily infested bales. These samples were weighed, each leaf was separated from the others, and the entire sample was shaken over a screen. The results of these tests are as follows:

Sample No.	Total Weight Ounces	Weight of	Loss in
		frass Ounces	weight Percent
1	48	9.5	19.8
2	42	8.0	19.0

These bales of tobacco were infested to an average depth of $2\frac{1}{2}$ inches and it was estimated that about 11 pounds in the two bales were infested at the rate of the above samples. This would give a loss of 2.13 pounds in the weight of these two bales. The value of Turkish tobacco, when it is ready for manufacture, is approximately 60 cents per pound, which would give a loss of \$1.27 on the two bales examined. With over one hundred million pounds of Turkish tobacco in storage in the United States, the direct loss that may result to the tobacco industry from insect infestation in this type of tobacco unless the recommended control measures are followed is impressive.

Further sampling of infested Turkish and domestic tobacco is expected to give a more accurate estimate of the loss in weight due to insect infestation. There is some loss from screening when uninfested bales are manufactured; the loss is much greater, however, in infested bales.

Economic effects of forecasting probable beet leafhopper injury in the Twin Falls-Jerome area since 1927.--J. C. Chamberlin, of the Twin Falls, Idaho, laboratory, has computed the gross gain to growers directly attributable to the forecasting service maintained since 1927, in the Twin Falls-Jerome area. Yields and acreage planted were computed for the 11-year period, 1916-1926, when no forecasting service existed, and the results compared with the period 1927-1933, when the service was in force. The result shows that, in addition to preventing the planting of large acreages in years of heavy infestation by Eutettix tenellus Bak., the planting of large acreages in years when infestation was low has resulted in a net gain of \$1,500,000 to the growers alone.

Conditions indicating heavy populations of beet leafhopper in Utah and Arizona breeding areas.--E. W. Davis, of the Salt Lake City laboratory, on a trip through the perennial breeding area in Utah and Arizona found host-plant conditions favorable for a heavy population of E. tenellus in 1934. Throughout the area alfilaria, an important host of the beet leafhopper, was growing thickly over most of the area below the 3,000-foot level. Counts showed approximately one leafhopper every $2\frac{1}{2}$ feet. All females collected were full of mature eggs. In localities where alfilaria had not germinated, E. tenellus were collected on Covillea, another important host. In the Nevada area no Plantago or alfilaria was found to have germinated. Eriogonum was germinated in a very limited area. In this area only one specimen, a female E. tenellus, was taken on Covillea.

Low temperatures handicap treatments for control of red spider on strawberry.--On his experiments for the control of the red spider (Tetranychus bimaculatus Harv.), W. A. Thomas of the Chadbourn, N. C., laboratory, reports as follows: "On January 30 the temperature dropped from normal spring weather levels to 8° F. with a maximum temperature during the day of 26° F., followed by another drop on the morning of January 31 to $5\frac{1}{2}^{\circ}$ F., which apparently is a low record for the section. Following this low temperature, strawberry leaves infested by the red spider were collected in the fields and brought to the laboratory for examination. These examinations revealed that practically all adults and nymphs had been killed, but the eggs were apparently not affected. These were hatching freely within 3 days.

"The red spider has been particularly abundant on strawberries during the past year. This condition has been greatly aggravated by the long-continued drought which lowered the vitality of the plants. Control treatments have not been successful to date, attributable apparently to the low temperatures of the late fall and winter and also the extreme difficulty of reaching the spiders on the under surface of the foliage, which at this season of the year lies prone on the surface of the soil."

Results of arsenical-residue-tolerance tests with winter cabbage.--In experiments conducted at Charleston, S. C., by W. J. Reid, jr., on the 1933-34 winter cabbage crop, the legal tolerance of 0.01 grain of arsenious oxide per pound of produce was exceeded by cabbage that received application of 2 pounds of paris green per acre 10 and 20 days before harvest. The paris green was diluted with 9 parts of hydrated lime. The tolerance was exceeded on cabbage that received application of 20 pounds of calcium arsenate per acre 10, 20, and 30 days before harvest. The residue limit was rather closely approached on cabbage dusted 30 days before harvest with the paris green mixture and by that dusted 40 days before harvest with calcium arsenate at the rate given above. Applications of these two arsenicals made at 10-day intervals during the remainder of the growing season did not result in an arsenic residue appreciably above that of unpoisoned cabbage.

The results of these completed experiments of the present season agree with those of last season except in the amount by which the tolerance was exceeded. The residues on cabbage of the 1933-34 season exceeded by several times that present on any preceding experiment. This difference was evidently due to rainfall. Only 2.28 inches of rainfall occurred during the course of the 1933-34 tests, as compared to a range in precipitation of from 7.66 to 11.32 inches during the periods preceding residue experiments.

Conditions favor pea weevil infestation in Idaho.--According to T. A. Brindley, Moscow, Idaho, prospects are favorable for a decided increase in pea weevil damage this coming season. If the weather continues mild the only redeeming feature of the situation will be the small hibernating population. An interesting result of the continued mild weather is the survival of volunteer peas in the winter wheat. Last fall during the harvest season unusual quantities of peas were shattered because of climatic conditions. Whole fields seeded to winter wheat resembled pea fields, so great was the quantity shattered. Favorable climatic conditions allowed practically all of these peas to germinate and, thus far, all of these peas have survived. It is possible, should the warm weather continue, that these peas will survive and absorb some of the weevil damage. This would alleviate the situation this crop season, but would breed large pea weevil populations for 1935.

Sperm found in male click beetle after mating.--As a part of the study of the question of whether a male click beetle can mate more than once, an investigation conducted by C. E. Woodworth, of the Walla Walla, Wash., laboratory, develops that after mating many sperm were left in the male. These were found in the lateral horns of the seminal vesicle and in the testes. Eggs have been obtained after the first mating in both Limonius canus Lec. and L. californicus Mann., and observations as to fertility are being made. The economic value of this study is to determine the importance of collecting male beetles at the time of the flight.

Importation of European earwig parasites.--S. E. Crumb, of the Puyallup, Wash., laboratory, has submitted a report on the importation, biology, and rearing technique of the European earwig parasite Digonichaeta setipennis Fall. during the period 1931-1933. The dates of collection, places of origin, number of earwigs, and percentage of parasitization for each shipment are shown in the following tabulation:

Source	Earwigs	Puparia	Parasitization
	Number	Number	Percent
France	14,872	78	0.405
Italy	110,400	1,604	1.45
England	17,500	1,049	5.99
Total	142,772	2,731	1.93

It will be noted from the above tabulation that the shipments from England yielded the highest rate of parasitization, with Italy and France following in the order named. The earwig mortality in these shipments ranged from 20 to 25 percent, owing principally to the lack of sufficient moisture in the shipping container.

Insecticidal effectiveness varies with species combated.--C. F. Stahl, of the Sanford, Fla., laboratory, in commenting on experiments conducted against the celery leaf tier, the southern armyworm, and the common cabbage worm with pyrethrum, rotenone, fluorine, and arsenical compounds, states, "Tests developed that pyrethrum is satisfactory for the celery leaf tier, but ineffective against the southern armyworm; rotenone is effective against the cabbage worm, but of no apparent value for the celery leaf tier and armyworm; fluorine and arsenic compounds are quite effective against the southern armyworm, but of no particular value for the celery leaf tier. More information is needed on the effectiveness of pyrethrum against the cabbage worm and it is hoped that this will soon be available."

Correction: In the January 1934 Monthly News Letter (Number 236), page 6, the fourth line from bottom should read "a cost of \$28 per 800 pounds" instead of "a cost of \$28 per 100 pounds."

FOREST INSECTS

Mountain pine beetle epidemic spreads through Idaho national forests.--J. C. Evenden, of the Coeur d'Alene, Idaho, field laboratory, writes: "In 1927 a small outbreak of the mountain pine beetle (Dendroctonus monticolae Hopk.) was reported from the eastern portion of the Nezperce National Forest. This outbreak was apparently a chance infestation from the severe epidemic that existed in the lodgepole pine stands of the Bitterroot and Salmon Forests. Since that date the infestation has spread northward, devastating all lodgepole pine stands in its path. An analysis of the 1933 ranger reports shows that this epidemic has passed through the Nezperce and Selway Forests, and now rests in the Clearwater, with a few spots of infestation on the St. Joe Forest. Although it is accepted that the remaining lodgepole pine stands within these forests

are doomed, the seriousness of the situation rests upon the possibility that the insects may transfer their attacks to white pine after depleting the lodgepole pine stands. As these tree species are equally acceptable hosts of this insect, and as white pine in association with lodgepole is already being attacked on the Clearwater, there is but small hope that such an occurrence will not take place. There are large bodies of valuable western white pine on the Clearwater and St. Joe National Forests which at this time are seriously threatened by this devastating epidemic of the mountain pine beetle."

Flights of forest insects.--T. T. Terrell, Coeur d'Alene, reports on a novel method for studying the flight habits of forest insects, and submits interesting information obtained by this method. It consisted of attaching a huge insect net to the kite wire of large Weather Bureau box kites. The kites were flown over open plains 25 miles up wind from the nearest timber. There was timber, however, 14 miles to the northwest and 10 miles to the east. Eight successful flights were made, during which the wind varied from southwest to west. Although a number of other insects were collected, only two bark beetles were obtained: One, *Ips oregoni* Eichh., was taken from the trap after a flight of $7\frac{1}{2}$ hours, during which the kite flew from 1,500 to 5,000 feet above the ground, and another was taken after a flight of $8\frac{1}{2}$ hours.

Life history of Oregon engraver.--The study of the biology of *Ips oregoni* and associated insects started in April 1931 and terminated at the close of the 1933 field season. During the first season (April to November), with air temperatures considerably above normal and precipitation below average, five complete generations of this bark beetle developed in 179 days. In 1932 and 1933 air temperatures and precipitation approximated those of an average season and there were only four complete generations of *Ips oregoni*, which developed in 184 and 180 days, respectively. From the results of the 3 years' study, air temperatures and moisture are considered to be the dominating factors in the development of the Oregon engraver beetle.

Infestations of western pine beetle influenced by last winter's temperatures.--J. A. Beal, of the Portland, Oreg., field laboratory, has just completed a report on the effect of low winter temperatures on emergence and subsequent infestation of the western pine beetle (*Dendroctonus brevicomis* Lec.) in eastern Oregon. A normal emergence of 112 beetles per square foot, based on actual count of emergence holes, was found to occur following mild winters. Emergence following the abnormally cold winter of 1932-33 ranged from 3 to 29 per square foot and was far below that of normal years. Reductions in emergence ranged from 74 to 97 percent, depending on the degree of cold reached in the area.

Subsequent reinfestation, based on the difference in volume losses between 1932 and 1933, was reduced from 23 to 75 percent, also depending upon the temperatures within the area and upon the degree of the infestation.

Although the freeze was very effective and widespread, its effect was found to be only temporary. The quick return during the summer to near epidemic conditions in some areas where overwintering broods had been extremely hard hit, showed that the effect of the freeze did not extend much beyond the emergence of the overwintering generation. This was reflected in the difference between beetle mortality and subsequent reinfestation on all areas examined.

Control of western pine beetle attempted on isolated tract.--F. P. Keen, Portland, reports that the first phase of an interesting control experiment has just been completed on the Ochoco National Forest, where a 40,000-acre isolated tract of ponderosa pine on the Maury Mountain division has been covered with control operations and 5,500 trees infested with the western pine beetle have been cut, peeled, and burned. The pine forests on Maury Mountain are separated from the main forest belt by 7 miles of open sagebrush country, and it will be interesting to see if the control is more effective than on other tracts of the Ochoco National Forest where the control areas are contiguous to untreated infested forests. The clean-up campaign was conducted by the Forest Service as a public works project.

The protection of fire-killed Douglas fir.--J. M. Whiteside, Portland, writes: "The first intensive examination to determine the results of a series of tree-medication tests on fire-killed Douglas fir has been made. Owing to a cessation of the physiological activities of trees at this season, the absorption of the solution has been very slow and very irregular, in both green and burned trees. In one of the green trees a very narrow streak of the sapwood has been stained 16 feet above the point of injection, while in the other trees the solution has reached an average height of only 4 feet. It is possible that the solutions will rise to a greater height during the present mild weather."

Control of mound-building ants.--H. J. MacAloney, of the New Haven, Conn., field laboratory, and N. W. Hosley, Harvard Forest, Mass., have recently prepared for publication a paper on Experiments in Simplified Control of Mound-Building Ants (Formica exsectoides Forel) in the Forest. Carbon disulphide and ethylene dichloride are effective, if used at times when most of the ants are in the mounds, as in the autumn after seasonal activity has ceased and the ants are in hibernation, or in the spring or summer during periods of high relative humidity and low atmospheric pressure. The most satisfactory method

is to remove the top material, punch holes in the center and margin down to the bottom of the nest, and pour in the liquid. Then the holes are filled with earth and the top material is replaced and tamped. A dosage of 1 pound (approximately 1 pint) is sufficient for a small mound, less than 18 inches in diameter; for a medium-sized mound, less than $2\frac{1}{2}$ feet in diameter, 2 pounds should be used. A larger mound may need two or more applications of 2 pounds each. Obviously, mounds should be treated when they are small, as the expense is less and the area affected is smaller.

European pine shoot moth killed by low temperature.--P. A. Berry, of the Melrose Highlands, Mass., field laboratory, reports concerning collections in January of larvae of the European pine shoot moth (Rhyacionia bucliana Schiff.) in Wakefield and Brookline, Mass. One hundred larvae were removed from infested shoots of pine collected in each locality and were examined to ascertain if they were living or dead. In each collection only 1 of the 100 larvae examined was alive. It is presumed that the death of the larvae was due to the unusually low temperatures of the latter part of December. Two of the larvae from Wakefield and 7 from Brookline contained the immature stage of a parasite of the genus Orgilus, all dead. Adults of Orgilus obscurator (Nees), a parasite received from Europe, had been liberated in each of the infestations from which the European pine shoot moth larvae were obtained and it was probably this species that was found in the parasitized larvae.

Estimating foliage area in deciduous woodland.--In summarizing experiments conducted in the summer of 1933, S. F. Potts and R. R. Whitten, Melrose Highlands, present figures relative to the area of foliage in an acre of deciduous woodland. In the area where these experiments were conducted the trees were entirely defoliated by the gipsy moth (Poputhetria dispar L.). At the time the larvae began to feed, cloth-covered trays, 3 feet square, were put out at equal distances in the plot so as to give random samples of excrement and partly eaten leaves that fell to the ground. This material was removed from the trays daily. From previous experiments Messrs. Potts and Whitten were able to ascertain from the weight of the excrement how much foliage had been eaten by the caterpillars. Based on the results from the trays they estimate that there were 4.6 acres of foliage to each acre of ground in the area sampled. It is also of interest that in totally defoliating the trees the caterpillars wasted approximately one third of the foliage, this falling to the ground in various-sized pieces.

In experiments conducted in previous years, in which a different method was used, Mr. Potts estimated that the area of foliage ranged from 4 acres per acre of ground for a medium stand to 7 acres for a very dense stand. In this method a given area of woodland was sprayed

with a known concentration of lead arsenate and the number of gallons and pounds per acre used was recorded. The amount of spray deposited on the ground was estimated from quantitative analyses of squares of absorbent paper that had been placed at intervals beneath the trees before spraying. Subtracting this amount from the amount of spray applied gave the amount on the foliage. After spraying, collections of leaves were taken from the top, middle, and lower branches of a number of trees and by quantitative analyses the amount of spray material on a certain area of foliage was determined. By dividing the estimated amount of spray material on all the foliage in the plot by that which the analyses showed was present on a known area of foliage, an estimate of the total area of foliage in the plot was arrived at.

Liberation of parasites in 1933.--A summary concerning parasites liberated by the Melrose Highlands, Mass., laboratory during 1933 shows that from material received from W. F. Sellers of the Budapest, Hungary, sublaboratory, a total of approximately 324,000 adults, belonging to 19 species, were put out by members of the laboratory staff or cooperating State officials in infestations of the European pine shoot moth, larch case bearer (Coleophora laricella Hbn.), satin moth (Stilpnotia salicis L.), gipsy moth (Porteretria dispar L.), elm leaf beetle (Galerucella xanthomelaena Schr.), and a birch leaf-mining sawfly, Phyllotoma nemorata Fall. Most of these parasites were liberated in New England and New York, but egg parasites of the elm leaf beetle were sent to other States, including California, and satin moth parasites to the State of Washington. Two additional species of introduced parasites established in New England were also sent to Washington, one to be liberated in areas infested by the satin moth and the other in similar situations and in territory infested with the pandora moth (Coloradia pandora Blake). Adults of the introduced predacious beetle Calosoma sycophanta L. were sent to the same State for liberation in areas where the hemlock spanworm (Elloptia fiscellaria Guen.) was abundant. It is not known whether the species sent will be able to sustain themselves in the hemlock looper and pandora moth infestations.

Canada cooperates in satin moth control.--During the summer of 1933 two members of the staff of the Belleville, Ontario, parasite laboratory of the Entomological Branch of the Canadian Department of Agriculture were in New England for the purpose of obtaining, for shipment to infested areas in Canada, three species of parasites that attack the satin moth. These species have all been introduced from Europe and established in New England by the Bureau of Entomology through the Melrose Highlands laboratory, where the representatives of the Canadian Department of Agriculture made their headquarters during the summer. They were able to make satisfactory shipments of the desired parasites.

CEREAL AND FORAGE INSECTS

White grubs attract sea gulls.--"The Biological Survey has brought to the notice of this office," reports W. B. Cartwright, Sacramento, Calif., "an interesting case of sea gulls and white grub damage to a golf course at San Francisco. One hundred and twenty-five acres of the course are infested with white grubs, with a maximum count of 200 grubs per square yard. The gulls damage the fairways by pulling the turf up and rolling it back or tearing it completely loose in search of the grubs. Jointly, the trouble and damage were costing the course one thousand dollars in December."

Corn meal in bait for tipulid control.--Mr. Cartwright also reports that an initial test of a corn meal-paris green bait, broadcast over a small area of range infested with the range crane fly, Tipula quayliai Doane, gave a 95 percent kill on January 15. The conditions were optimum for an even distribution of the mixture, which later tests did not have, and did not ensure a practical control. The minimum proportions of poison and meal was 2:100.

Chinch bug wintering in volunteer wheat.--W. T. Emery, Wichita, Kans., reports that the volunteer wheat serving as winter coverage for the chinch bug (Blissus leucopterus Say) averaged 52 bugs per clump in three clumps examined. A square foot of Andropogon bordering a wheat field contained 142 bugs.

Chinch bugs wintering successfully in northern Indiana.--P. Luginbill and W. B. Noble report that hibernating chinch bugs evidently suffered very little mortality in the vicinity of Lafayette, Ind., up to January 19. Out of 465 bugs in bunches of corn husks taken from the field on that date, only 5 percent were dead. Up to that time the weather was very mild, the lowest temperature recorded at Lafayette being -2°, with very little snow, and precipitation considerably below normal.

Final series hybrid wheat selections examined.--E. T. Jones, Wichita, Kans., reports that examination of the final series of F₅ and F₆ generation hybrid wheat selections for the 1934 crop year has been completed. Although the infestations were slight, a trend toward resistance to the hessian fly was shown for the hybrids.

Hessian fly larvae passing winter in good condition.--J. R. Horton, Wichita, reports that dissections of over 300 puparia of the fall generation of Phytophaga destructor Say during December and January indicate that approximately 93 percent of the larvae are viable and that over 55 percent have reversed their position in the puparia. Soil moisture is sufficient, although no precipitation was recorded during the latter half of the month. The mean temperature for the latter half of January was 40.9° F.

Condition of hessian fly in hibernation in Tennessee and Indiana.--
Practically all the hessian fly were in puparia and dormant at Lafay-
ette, Ind., in January. At Fayetteville, Tenn., however, the mild
weather and ample rainfall during January actually caused a little
pupation. Curtis Benton found 2 live pupae in 100 puparia dissected
on January 26. His dissections of puparia late in January also showed
about 4 percent mortality.

No significant difference between 100-unit samples and 36-unit
samples for hessian fly.--J. R. Norton also reports on experiments
to determine if samples as small as 36-units, either plants or culms,
are reliable when fly population is at a minimum. Method: 16 samples
of 100 units each were taken from an irrigated and from a nonirri-
gated wheat plot and compared on the basis of infestation and fly
population with 16 samples of 36 units each from the same plots. The
standard errors $X 3$ ($30M$) were used as a basis of comparison for plant
and culm infestations and for number of puparia per 100 plants and
per 100 culms. Results: The true means would fall within the follow-
ing range with only one chance in about 135, in each case, of being
wrong. The actual means and the range were as follows:

(1) Plant infestation

Population on plants

100-plant units

<u>Plot</u>	<u>Range</u> <u>Percent</u>	<u>Mean</u> <u>Percent</u>	<u>Range</u> <u>Percent</u>	<u>Mean</u> <u>Percent</u>
Irrigated	5.4 - 8.6	7.0	6.9 - 12.7	9.8
Nonirrigated	1.9 - 5.7	3.8	2.2 - 7.4	4.8

36-plant units

Irrigated	3.0 - 12.3	7.6	3.4 - 20.2	11.8
Nonirrigated	0.6 - 5.5	3.1	0.3 - 9.3	4.8

(2) Culm infestation

Population on culms

100-culm units

Irrigated	1.3 - 2.9	2.1	1.9 - 4.5	3.2
Nonirrigated	0.7 - 1.9	1.3	0.5 - 2.3	1.4

36-culm units

Irrigated	0.2 - 5.0	2.6	0.3 - 8.1	4.2
Nonirrigated	0.0 - 2.0	0.8	0.0 - 2.5	0.9

Conclusion: On the basis of an equal chance of being right within the prescribed limits, it made no practical difference whether 100-unit samples or only 36-unit samples were examined. The 100-unit sample, however, more narrowly restricted the range within which the probability was as stated that the mean would fall.

Platygaster herrickii parthenogenetic.--W. T. Emery, Wichita, reports on the outcome of two experiments with this species started in January 1933 from which 23 males and 7 males, respectively, have now emerged, indicating, he says, that the original specimens in this case were arrhenotokous.

Parasite of alfalfa weevil to be liberated at Medford, Oreg.--According to George I. Reeves, 2 consecutive years of observations at Medford have shown that the climatic conditions prevalent there may reasonably be expected to exert a large degree of control over Hypera postica Gyll., but not entirely to prevent its ravages, and that no interference with natural and cultural control of the pest is to be apprehended from the introduction of Bathyplectes curculionis Thoms. Several thousand cocoons of this parasite collected at Salt Lake City, Utah, during the past season were accordingly taken to Medford late in January by R. C. Newton upon his return to that place after a month spent in analysis of his field observations and similar data relating to other localities in the alfalfa weevil territory. A good emergence is expected from these cocoons, whose development will be delayed until the larvae of the host are available, and the adult parasites will then be liberated in carefully selected fields.

Pea aphid on vetch, Austrian field peas, and Scotch broom.--L. P. Rockwood reports that "Aphids (Illinoia pisi Kalt.) increased slowly on vetch on our plots at Forest Grove, Oreg., seeded on Sept. 19, Oct. 5, and Oct. 18, 1933. A few alates and nymphs were taken on these plots on January 11, but none on January 29. Aphids decreased greatly on volunteer Austrian peas near Barlow, Oreg., coincidentally with extensive damage to the peas by a fungous disease. The same has been true, to a lesser degree, on plots of Austrian peas seeded on Sept. 19 and Oct. 5, 1933, at Forest Grove. Plots sown later show but little damage from the fungous disease. Plots of peas and vetch seeded on Nov. 6, 1933, showed no aphids on January 29 upon careful examination. The fungous disease caused by Empusa aphidis was present among aphids on early sown vetch and pea plots at Forest Grove on January 11 and 29. The young of I. pisi were hatching from eggs on Scotch broom in Clackamas County on January 30. Examination of eggs on the twigs showed that more than 40 percent had hatched in one locality on the banks of the Molalla River. The larvae seen were quite small, probably in the first stage."

Population of western spotted cucumber beetle reduced.--According to T. R. Chamberlin, "In April 1931, flood waters of Gales Creek, near Forest Grove, deposited millions of adults of Diabrotica soror Lec. with trash along fence rows. Late in December 1933 a similar flood enabled us to obtain comparable data in regard to the abundance of these beetles in the same area. The fence rows previously examined showed the same conditions resulting from the flood, except that only a few beetles were found in the trash. This showed that where thousands of beetles had emerged from hibernation in this area in 1931 only 1, comparatively speaking, had hibernated in the same area in 1933-34. The great reduction in the population of this species appears to have been an after effect of the freeze of December 1932 without snow covering.

Hot soil destructive to insects.--Geo. W. Barber, Savannah, Ga., reports: "In the latitude of eastern Georgia from May to September, inclusive, soil unshaded by plants often becomes quite hot during the warmest hours of the day. The shade temperatures nearly every day then reached between 90° and 100° F., and the maximum was reached between noon and 3 p.m. Readings from a chemical thermometer placed on the soil surface in unshaded spots ranged from 120° to 140° F., during the warmest period of the day, and a maximum of 150° F. was once observed. The higher temperatures are too great for lepidopterous larvae to endure. Mr. Barber repeatedly observed that larvae of Heliothis obsoleta Fab. and Laphygma frugiperda S. and A. died when venturing on unshaded soil in cornfields during the hot hours of the months mentioned. But the most remarkable instance of the destruction of large numbers of an insect by contact with hot soil was observed in Washington County, Ga., the insect being the velvetbean caterpillar (Anticarsia gemmatalis Hbn.), in September 1933. In a 30-acre field of soybeans great numbers of these larvae were feeding from September 8 to 21. Many more larvae were present than could mature on the food available; consequently, after all the leaves had been devoured, the larvae left the plants to seek other food. The soil, no longer shaded by the leaves, received the full force of the sun. It was observed that countless thousands of these larvae had perished on this hot soil, and over much of the area the dead bodies averaged several per square foot of surface. In another soybean field, of about 20 acres, which was wholly stripped of leaves during the last week of August, examination of pupae recovered from the soil showed that 27.6 percent had died, and as this insect pupates just below the surface of the soil, and as the leafless plants afforded no shade, the heated soil probably caused most of these pupae to perish.

Preliminary results of sprays for control of southwestern corn borer.--The following report has been submitted by E. G. Davis, Tempe, Ariz.: Since 1929 several different kinds of dusts and sprays have been applied in cornfields at Tucson, Ariz., to ascertain their value against Diatraea grandiosella Dyar. The dusts were applied as larvi-

cides and the sprays as both larvicides and ovicides. All of the applications were directed against the second generation of D. grandiosella, as this stage causes the most severe damage. The following tables show the results obtained with the various materials over the period 1929 to 1933, inclusive. These results were based on the percentages of stalks tunneled, and not on the percentages of borers killed.

SPRAYS

Material	Strength	Larvae in infested stalks:			
		spray	Treated	Check	Control
Miscible oil	: 2.5 percent	Ovi-cide	17	45	62
Sunoco oil	: 1.0	do	40	45	11
Penetrole oil.....	: 1.0	do	55	45	none
Medina emulsion.....	: 1.0	do	46	45	do
Mistoil.....	: 1.0	do	55	45	do
Libex oil.....	: 6.0	do	34	45	24
Red Arrow oil.....	: 1 oz. to 5 ¹	do	49	45	none
Miscible oil (1 appl.)	: 1.0 percent	do	37	47	21
Miscible oil (2 appls.)	: 1.0	do	27	47	42
Miscible oil (3 appls.)	: 1.0	do	19	47	80
Lead arsenate.....	: 4 lbs. to 100 ¹	Larvicide	36	45	20
Lead arsenate	:	do	34	46	26
.. and fish-oil soap.....	: 2 lbs. to 100 ¹	do	31	53	41
Cryolite and	:	do	40	54	25
fish-oil soap.....	: 2 lbs. to 100 ¹	do	40	51	21

1

Gallons of water

DUSTS (APPLIED AS LARVICIDES)

Materials	Strength:	Infested stalks in plots					
		1929		1930		1931	
		Treat- ed	Check %	Treat- ed	Check %	Treat- ed	Check %
		%	%	%	%	%	%
Barium fluosil.& hyd.lime...	20	--	--	--	--	--	--
Do	25	--	--	--	--	--	--
Do	30	--	--	--	--	--	--
Barium fluosil.,hyd.lime, & engine oil.....	30	--	--	--	--	--	--
Barium fluosil.& hyd.lime...	33	--	--	15	46	34	75
Do	50	--	--	--	--	42	71
Do	66	--	--	--	--	56	72
Do	80	--	--	--	--	37	75
Do	Full	--	--	--	--	46	71
Barium fluosil. & talc.....	20	--	--	--	--	--	--
Do	30	--	--	--	--	--	--
Barium fluosil., talc, and engine oil.....	30	--	--	--	--	--	--
Barium fluosil. & talc.....	33	--	--	14	46	--	--
Do	80	--	--	--	--	41	65
Barium fluosil.& sulphur dust.....	20	--	--	--	--	--	--
Do	30	--	--	--	--	--	--
Barium fluosil. com. prod...	20	--	--	--	--	--	--
Do	30	--	--	--	--	--	--
Do	80	--	--	3	47	42	65
Sodium fluosil.& hyd.lime...	33	--	--	31	34	--	--
Do	Full	18	45	--	--	--	--
Cryolite & hyd. lime.....	33	--	--	23	40	--	--
Do	80	--	--	--	--	47	72
Talc.....	Full	--	--	--	--	55	74
Derris.....	do ¹	--	--	--	--	--	--
Nicotine dust.....	1 to 5 ¹	67	45	--	--	--	--
Lead arsenate & hyd. lime..	1 to 4	55	45	--	--	--	--

¹

1 oz. to 5 lbs. hydrated lime.

(Continued on next page)

DUSTS (APPLIED AS LARVICIDES) (Continued)

Materials	Strength:	Infested stalks in plots:						Average control 1929-1933
		1932		1933		Treat- ed		
		Treat- ed	Check	Check	ed	%		
Materials	Strength:	%	%	%	%	%	%	%
Barium fluosil. & hyd. lime.....	20	26	75	12	16	45		
Do	25	21	69	--	--	69		
Do	30	23	66	8	25	66		
Barium fluosil., hyd. lime, & engine oil.....	30	10	72	--	--	86		
Barium fluosil. & hyd. lime.....	33	--	94	--	--	60		
Do	50	--	99	--	--	40		
Do	66	--	--	--	--	22		
Do	80	--	--	--	--	37		
Do	Full	--	--	--	--	35		
Barium fluosil. & talc.....	20	--	--	19	35	45		
Do	30	--	--	8	37	78		
Barium fluosil., talc, and engine oil.....	30	--	--	6	43	86		
Barium fluosil. & talc.....	33	--	--	--	--	69		
Do	80	--	--	--	--	36		
Barium fluosil. & sulphur dust..	20	--	--	17	34	50		
Do	30	--	--	14	29	51		
Barium fluosil., com. pro.	20	--	--	26	37	29		
Do	30	--	--	20	25	42		
Do	80	0	78	3	36	79		
Sodium fluosil. & hyd. lime.....	33	--	--	--	--	8		
Do	Full	--	--	--	--	60		
Cryolite & hyd. lime.....	33	--	--	--	--	42		
Do	80	--	--	--	--	34		
Talc.....	Full	--	--	--	--	25		
Derris.....	do	--	--	4	43	90		
Nicotine dust.....	1 to 5 ¹	--	--	--	--	None		
Lead arsenate & hyd. lime.....	1 to 4	--	--	--	--	None		

1

1 oz. to 5 lbs. hydrated lime.

None of the spray materials proved highly satisfactory. The 1 percent miscible oil applied as an ovicide gave good control where three applications were made; it is not practical, however, to make this number of applications commercially. Laboratory tests with the miscible oil at a dilution of 1 to 400 on borer eggs gave 100 percent control, but it was not possible to spray all of the eggs in the field because of their inaccessible location on the corn plants.

Dusts have given more promise of borer control than have the sprays. Barium fluosilicate has been superior to the other materials tried, with the exception of derris, which as yet has been tried in only a preliminary way. Talc and hydrated lime have proved to be satisfactory carriers. The talc was slightly superior to the hydrated lime. Eighty percent barium fluosilicate dust (commercial product) gave the highest percentage of control, although strengths of 30 percent have resulted in satisfactory kills. The addition of small quantities of engine oil to two of the 30 percent barium fluosilicate dusts resulted in increased efficiency.

COTTON INSECTS

Boll weevil hibernation in Spanish moss.--The annual fall Spanish moss examinations by various members of this division to determine the number of boll weevils entering hibernation were completed on December 8 and have been summarized by R. C. Gaines of Tallulah, La. The records for this fall include examinations from 39 points in 12 localities in Louisiana, Alabama, Georgia, and South Carolina and are shown in the following table together with previous records for comparison.

Locality	Live weevils per ton of moss								
	1925	1926	1927	1928	1929	1930	1931	1932	1933
Tallulah, La.	280	242	21	240	189	49	724	881	365
Southern La.	1,581	192	357	669	100	425	1,157	510	711
South Carolina.....	52	48	1,525	768	222	475	172	340	78
Georgia.....	39	359	220	218	170	374	340	845	28
Alabama.....	---	---	148	55	195	343	131	147	97

It will be noted that with the exception of 1931 and 1932 365 live weevils per ton of moss at Tallulah is the highest number in any year for which records are available. For southern Louisiana, 711 live weevils per ton is greater than in any year except 1925 and 1931. For South Carolina, this year's record of 78 weevils per ton is less than that of 1927 to 1932, inclusive. For Georgia, the 28 weevils per ton is the lowest number ever recorded. For Alabama, the 97 weevils per ton this year is less than for any previous year except 1928.

Soil-animal investigations and relationship of insects to cotton diseases.--L. Dean Christensen, temporarily employed from August 7 to December 6 at the Bryan, Tex., laboratory, working in cooperation with J. J. Taubenhaus, of the Division of Plant Pathology and Physiology, Texas Agricultural Experiment Station, has reported on the season's work. Feeding by insects upon the roots of cotton was again found to be light under normal conditions in the areas examined in Texas. In well-cultivated cotton fields a maximum of 4,846 white grubs per acre were encountered; in poorly cultivated fields, rich in grasses, an average of 13,730 per acre, and in cornfields an average of 30,460 per acre were found. Wireworms were occasionally found but never in concentration. Six other species of soil-inhabiting and surface-roving beetles were found. This year's population studies of the smaller soil animals have been confined to late summer estimates of cotton fields on Houston clay near Temple, Tex. Average results by soil depths were as follows:

Depth in inches	Soil organisms	
	Per acre Number	Per cubic inch of soil Number
0 to 6.....	85,900,320	.28
6 to 12	18,295,200	.49
12 to 18.....	12,196,800	.32
18 to 24.....	8,537,760	.23
Total.....	124,930,080	---

Experiments were conducted with some of the more common cotton field insects to determine the possibility of their spreading Fusarium wilt of cotton by ingesting the fungus with their food and depositing it in a viable form with the feces and also by spores adhering to the

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body. The insects were caged with diseased plants or fed leaves painted with spores. The fecal pellets were sterilized externally and then cultured. As a summary of the studies concerning wilt and its viability through the insect stomach, it may be stated that--

"(1) Certain insects may ingest wilt fungus and pass it through their bodies in a viable state. Such insects include: The red-legged grasshopper (Melanoplus femur-rubrum DeG.), the differential grasshopper (Melanoplus differentialis Fbos.), the American grasshopper (Schistocerca americana Drury), and other miscellaneous grasshoppers; the larval stages of the cotton leaf worm (Alabama argillacea Hbn.), the fall armyworm (Laphygma frugiperda S. & A.), the yellow-striped armyworm (Prodenia ornithogalli Guen.), and the boll weevil (Anthonomus granalis Boh.); white grubs including Phyllophaga crassissima (Blanch.); the larval stage of Ataxia crypta (Say); and the soil-animal organisms. Of the insects mentioned, some are vigorous flyers and may spread fungus organisms in this manner. Other forms, as larvae, would not appreciably affect distribution of the disease.

"(2) The fungus organisms seldom remain within the insect body in a viable state until the formation of the imago. Evidence to date indicates that the time period during which the fungus is exposed to alimentary fluids is an extremely short one."

In the experiments testing the carrying of the wilt spores mechanically on their appendages, all but one of the species of insects tested and a spider were positive. Work begun last season to establish the possible relationship of certain insects to Texas root-rot fungus indicated that insects did not transport the causative fungus in a viable state. This season's work corroborated last year's results for--

"(1) No single instance of insects and other organisms carrying or disseminating viable Phymatotrichum material has yet been obtained.

"(2) Certain insects which feed on the fungitic hyphal strands render them nonviable, alimentary fluids seemingly having a lethal effect.

"(3) Certain insects have been observed to feed upon the various stages of the fungus of Texas root rot in nature, reducing the infective element in the soil which would reinfect plants during subsequent years. This function is considered by the writer, however, to be a minor one. It is doubted that soil animals would ever act in this capacity to the extent of clearing up root-rot areas. Such a conclusion is based on what has been observed regarding habits and abundance of organisms in the soil, as compared with the abundance and habits of the fungus in the same area. Where rot areas recover the role of soil organisms is regarded as perhaps a contributing factor but never as a causative one.

"(4) Alimentary fluids of insect apparently do not provide the stimulus which causes continuation of growth after spore germination.¹ No growth of the fungus has yet been obtained in cultures of millions of spores that have passed through insect bodies or in cultures of organisms that have fed or might have fed on them."

¹ The sending out of a single short protuberance which has always failed to continue growth is interpreted here as being a germination process.

Insects and a mite of potential economic importance found on wild cotton in Florida.--After the finding of the pink bollworm (*Pectinophora gossypiella* Saund.) in Florida in the spring of 1932 a survey of the wild-cotton situation was made and four insects and a mite not previously known to occur in this country were found. These are discussed in a paper to be published by C. F. Rainwater, Tallulah, La. Below the frost line in Florida Gossypium of one or more species closely related to our upland cotton (*G. hirsutum*) grows as a perennial and is likely to be found wherever there is high land. Under these conditions the following tropical insects were found to have become established:

The larvae of the wild cotton borer (Rhodoneura terminalis Walk.) attack and severely damage the stems, squares, blooms, and bolls of wild cotton by eating away the inner contents. They show preference for the fruit, attacking the stems only when fruit is absent. They enter the square or boll near the base and eat away the entire contents, and they enter the stem at the tip and tunnel downward from 2 to 5 inches, causing it to wither and break off. This insect was found in Florida wherever wild cotton was found, the infestation ranging from practically nothing to 62 percent of the fruit. It had previously been reported on cotton in Mexico, Costa Rica, the Canal Zone, Haiti, and Santo Domingo.

The flower-bud maggot (Contarinia gossypii Felt) was previously known from the West Indies, where it attacks only the squares and flowers. In Florida it was also found in the bolls. The attacked squares become yellow, and the base near the bracts has a tendency to become detached and dry up. The injured parts become dark and watery, and have a very characteristic odor. The damage to the flowers is similar to that of the squares and in both instances shedding usually follows. In the bolls the larvae seem to prefer the immature seed. The lint surrounding infested seed becomes discolored and decomposes and the bolls become soft and watery, sometimes dropping to the ground without opening. This insect also was found wherever wild cotton was found in Florida.

The cotton blister mite (Eriophyes gossypii Banks) attacks any part of the cotton plant above ground, although its attack upon the fruiting parts is confined to the bracts. It causes wartlike protuberances and plants attacked are considerably dwarfed, or may be entirely killed. Damage is very localized and plants within a few yards of severely attacked plants were not injured. Its distribution in Florida is "spotted" in the southern part of the peninsula, and up the west coast to Punta Gorda and along the keys. It is known to occur in Martinique, Nevis, Barbados, Puerto Rico, and the Virgin Islands.

The larvae of a cotton leaf miner (Nepticula gossypii Forbes and Leonard) make sharply angulated mines in the leaves, causing them to fall, and also mine the bracts of the squares, blooms, and bolls. A heavy infestation causes severe shedding of foliage. This miner was previously known only from Puerto Rico, where it was described in 1930. It is not generally distributed in Florida but is found on the extreme tip of the peninsula, on the numerous keys, and around Fort Myers.

Anomis impasta Guenée has been reported on cotton from Brazil, Barbados, and Coba. It was reared from a wild cotton blossom taken on Long Key, Fla., but its importance as an economic insect seems negligible.

The above-named five species are discussed in the order of their importance as found on wild cotton in Florida. The first four seem worthy of consideration as of potential economic importance.

Boll weevil control tests at Florence, S. C., in 1933.--F. F. Bondy reports that eight treatments or combinations of treatments were used, duplicated from 2 to 6 times, on 54 plats of approximately 1 acre each. The plats were laid out as 15 two-plat tests, one treated, and one untreated check; and 8 three-plat tests, two treated, and one check; all together, 31 treated plats and 23 check plats. In the table below the different treatments are averaged and the gain or loss based on the average yield of the corresponding checks.

			: Gain or loss:		: Average
	: Plats	: Average	: of seed	: Average	: profit
	: treat-	: appl.	: cotton	: cost	: or loss
	: ed	: per acre	: per acre	: per acre	: per acre
			: Range:	Average:	:
		: No.	: Lbs.	: Lbs.	: Dollars
Cal.ars.dust after 10% infestation (3-6 appls., average 4.83).....	6	6.99 lbs.	312	183	2.45 3.65
Cal.ars.and hyd. lime dusts: (1-1) after 10% infestation (3-8 appls., average 6.2).....	5	8.15 "	341	234	2.32 5.48
Cal.ars.and hyd. lime dusts (1-3) after 10% infestation (5 appls.).....	3	8.84 "	4175	81	1.48 1.22
Cal.ars.and builders' lime dusts (1-3) after 10% infestation (5-8 appls., average 6).....	3	9.68 "	198	167	1.51 4.06
3 early appls.molasses-cal.ars.(1-1-1) mixture.....	6	2 gals.	91	20	.79 -.12
3 early appls.molasses-cal.ars.(1-1-1) mixture followed by 3 dustings cal.ars. after 10% infestation.....	2	6.90 lbs.	95 ¹	104	2.32 1.15
3 early appls.molasses-cal.ars.(1-1-1) mixture followed by 5 dustings cal.ars. after 10% infestation.....	4	6.85 lbs.	402	253	3.32 5.11
3 early appls.molasses-cal.ars.mixture (1-1-1) followed by 5 dustings cal.ars. and hyd.lime (1-1) after 10% infestation.....	2	8.30 lbs.	594 ²	380	2.71 9.96

1 Very slight weevil damage.

2 Unusually high--more than could normally be expected.

Special attention was given this year to reducing the amount of arsenic applied for weevil control by early season "mopping" with molasses-calcium arsenate and water (1 - 1 - 1) mixture, and by diluting the calcium arsenate with hydrated lime. Reduction of the amount of arsenic used is important on certain types of sandy loam in this section where excessive amounts of arsenic cause soil injury. Lime also has a beneficial effect on certain soils in preventing injury from arsenic and a tendency to reduce plant lice infestation. It will be noted that in some series of tests the gains from poisoning are not very consistent. This was directly due to a difference in severity of weevil damage, soil type, and amount of fertilizer used. Relatively few applications of dusts were made because of the low early infestation of squares and the early maturity of the crop. In compiling the cost and profit per acre, the following figures were used: Calcium arsenate, 6 cents per pound; lime, 1 cent per pound; molasses (blackstrap), 14 cents per gallon; labor for dusting, 10 cents per hour; labor for molasses-mixture applications, 7 cents per hour; cotton valued at 9 cents per pound and seed at \$10 per ton. The profits from poisoning for 1933 are lower than the 5-year average, owing to the decrease in the amount of fertilizer used and the low weevil damage. The outstanding points in this season's control work are the possibility of using lime with calcium arsenate as a dust and the combination use of the early liquid poison followed by dusts later in the season.

INSECTS AFFECTING MAN AND ANIMALS

C. W. A. work in control of pest mosquitoes and ticks.--At the end of January approximately 21,200 men were employed on the Civil Works Administration mosquito control project in 32 States and the District of Columbia. To facilitate the intelligent direction of the work 4 New Jersey men familiar with the methods found to be effective in that State have been appointed to aid in general supervision of the field work. They are, Lester W. Smith, R. J. Van Derwerker, William Thom, and Morgan Hand. In addition, Norman G. Platts, in charge of Mosquito Control Work in Indian River County, Fla., has been added to the temporary supervising force. Also the following members of the permanent staff have been active in the work: W. V. King, D. G. Hall, J. B. Hull, and E. C. Cushing. The latter has been assigned to the Washington office for the purpose of assisting in digesting and collating field reports.

The tick control work is more or less experimental in nature and is conducted on a much smaller scale than the mosquito work, 370 men having been employed in Maryland, Delaware, Virginia, and the

District of Columbia. H. S. Peters, of the permanent staff, has been in charge of the work in Maryland and Virginia. In Delaware L. A. Stearns directed the work. It is of interest to note that in connection with the tick control work a number of ticks were found attached to mice and sucking blood in midwinter.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

The large collection of beetles assembled by the late Henry F. Wickham of Iowa City, Iowa, was recently presented to the U. S. National Museum by his widow, Mrs. Wickham. The offer of the collection was made through L. L. Buchanan, of the Identification and Classification staff, and was contingent on his going to Iowa City to prepare and ship the specimens. Mr. Buchanan left Washington the last of December and completed his work so that the collection was received at the Museum on January 18. It includes about 225 double (book-type) wooden boxes, containing an estimated total of 70,000 specimens, most of which are well mounted, accurately labeled as to locality, and in excellent condition. All the principal groups of beetles are included, but the Cicindelidae, Cleridae, Tenebrionidae, Scarabaeidae, and Cerambycidae are better represented than most other families. In the Cicindelidae (tiger beetles), a group in which Professor Wickham was especially interested, the species are from all parts of the World, and in two or three other families there is a fair amount of exotic material; but for the most part the collection contains species from North America only (including Mexico, the Bahama Islands, Alaska, and Canada). The collection is notable for the relatively large proportion of specimens from the Western and Southwestern States, a region over which Professor Wickham collected for many years. The exact number of type specimens has not been ascertained, but in addition to the types of the 43 species that Wickham himself described, there are probably 50 or 60 additional types or paratypes described by other workers. Professor Wickham's collection of fossil insects and plants, consisting of about 3,000 specimens and including a considerable number of beetle types, also was presented to the Museum and was shipped to Washington by Mr. Buchanan along with the beetle collection.

Mr. Buchanan has recently identified several specimens submitted to the National Museum by F. H. Shirck of Parma, Idaho, as the rare weevil Tachypterus consors Dietz. The weevils were collected June 4, 1933, at Banks, Idaho, on a "shrub," leaves of which accompanied the beetles. The plant has been identified by C. V. Morton of the National Herbarium as serviceberry (Amelanchier floridana). So far as known, this is the first indication of the host plant of this insect.

Three specimens of Plectris aliena Chpn. have been sent in from the Japanese beetle laboratory, Moorestown, N. J., to E. A. Chapin, who has verified their tentative identification as this species. These specimens were taken in Japanese beetle traps at Charleston, S. C., Savannah, Ga., and Miami, Fla. The Georgia and Florida records are new and greatly widen the known distribution of the species.

In the course of his fruit fly identifications, covering the Mexican orange worm work in the lower Rio Grande valley, F. H. Benjamin has recently recognized a new segregate, of incompletely determined status, but closely resembling Anastrepha ludens, in the trap material that is being submitted to him.

Mr. Benjamin has recently identified and added to the Museum collections several interesting specimens received from Frank Morton Jones of Wilmington, Del. The species include Melipotis januaris Guen. and Chloropteryx psularia Moesch., both collected in Florida and not previously reported from the United States.

August Busck has just completed a paper describing, as a new genus and species, specimens of a small moth found feeding in Portland, Oreg. on Cotoneaster horizontalis, a Chinese plant of the family Rosaceae. The specimens came in for determination from J. R. Roaf, Corvallis, Oreg. Since the insect shows no close relationship to any American species of its family, Mr. Busck feels that it is legitimate to suspect that it has been introduced from China with its host plant. Because of the immense economic importance of the host family, the species should be watched carefully.

Mrs. J. Bonne-Wepster, of the Medical Laboratory, Batavia, Java, is spending several weeks at the National Museum studying Philippine mosquitoes. This is Mrs. Bonne-Wepster's first visit to this country since 1919, at which time she and her husband, Dr. C. Bonne, spent some time here studying neotropical mosquitoes in connection with the preparation of their valuable book, The Mosquitoes of Surinam. Dr. Bonne is also in Washington but he now devotes his time to cancer research.

Specimens of four species of Chalcidoidea, Eurytoma fellis Girault, Epimegastigmus brevivalous Girault, E. trisulcus Girault, and a new genus and species of Megastigmatae, all reared from galls on citrus, were recently received by A. B. Gahan from N. S. Noble, Assistant Entomologist, Department of Agriculture, New South Wales. A paper by Noble (Agr. Gaz. N. S. Wales, June 1, 1933, pp. 465-469) indicates that the Eurytoma causes serious damage to the citrus and especially to nursery stock. The record is important economically because of the possibility that the insect might be readily spread through shipment of nursery stock.

Among the parasite specimens taken in Idaho in connection with sugar-beet leafhopper studies, and recently submitted for identification by J. C. Chamberlin, is a series of 7 specimens, including several females, identified by C. F. W. Muesebeck as Apanteles monticola Ashm., which was previously known only from the holotype male from Colorado.

Mr. Muesebeck has identified as Plastanoxus westwoodi (Kieff.) several specimens of a small bethylid parasite of certain Coleoptera that infest stored grain. The specimens were received from E. J. Hambleton, who had obtained them in Minas Geraes, Brazil. The species has previously been recorded from Africa, Australia, and North America.

Recently Robert Veitch, Chief Entomologist, Department of Agriculture and Stock, Brisbane, Australia, sent to the Chief of the Bureau of Entomology a specimen of the very interesting Hemiodoecus veitchi Hacker. The specimen was presented to the U. S. National Museum by the Bureau, and has been incorporated in the Museum collections by H. G. Barber, who has also reviewed the original description and other published information on this and related species. Several specimens of this peculiar species were collected in association with Antarctic beech trees on the Lemington Plateau, in the National Park, McPherson Range, Queensland, Australia, April 10, 1933. This species was described by H. Hacker (Queensland Agr. Jour. 37, pt. 5, May 1, 1932) as belonging to the family Peloridiidae. Previously W. E. China and J. G. Myers (Ann. Mag. Nat. Hist. (10) 3, 282-294, 1929), in a critical analysis, had placed the family Peloridiidae, which has long been considered as heteropterous, in the suborder Homoptera under a proposed new series Coleorrhyncha.

P. W. Oman has recently identified specimens of Peregrinus maidis (Ashm.) for L. Haseman of the University of Missouri, who reports that they had become quite a pest on corn grown for experimental purposes in a greenhouse at Columbia. The species is a common pest of corn and related plants and is known to occur throughout most of the tropical regions of the world, but its occurrence so far north is unusual. It is also of interest to note that both nymphs and adults were present in the material sent by Dr. Haseman, suggesting that the insect is breeding continuously through the winter.

An interesting record of parasitization of leafhoppers has just been observed by P. W. Oman. In 406 specimens of Aceratagallia fuscoscripta Oman, collected in southern Idaho in 1932 and recently sent in for determination, there were 85 specimens which showed visible parasitization by Stylopidae. While the percentage of parasiti-

zation (21 percent of the total) is not unusual, the parasitization of specimens collected in a single locality on a single date occasionally exceeded 60 percent. For example, in 50 specimens labeled as follows: Tuttle, Idaho, No. 14, July 8, 1932, S. pestifer, D. E. Fox, 33 showed visible parasitization (66 percent). Of 20 specimens labeled as follows: Tuttle, Idaho, No. 14, July 20, 1932, S. pestifer, D. E. Fox, 13 showed visible parasitization (65 percent). Other localities showed similar high percentages of parasitization but with a smaller number of specimens.

INSECT PEST SURVEY

During the month (February) the Survey has completed the Annual Summary of the 1933 volume of the Insect Pest Survey Bulletin. The index to this volume is being checked and will be published shortly.

A new application of the information obtained by the Survey has been made within the month. Insurance companies are requesting information on the relative abundance of important insect pests in different parts of the country in order to inform themselves of the hazards they might expect in farm loans.

With the starting of a new volume of the Survey bulletin on March 1, we are particularly anxious that the entomologists of the several divisions of the Bureau, including the men at the various field stations, shall feel that the Survey is a definite activity of the Bureau for which they are as much responsible as are the outside collaborators in the experiment stations, colleges, and departments of Agriculture in the States. At the present time the Insect Pest Survey has 103 outside collaborators located in the 48 States and in the Territories of Puerto Rico and Hawaii, with additional reporters in Brazil, Costa Rica, Egypt, and Mexico. Any observations made will be of interest to the Survey, even though they seem trivial at the time. The Survey has prepared a post-card report form, a number of which can easily be carried in a coat pocket. Notes can then be made in the field, and the card mailed at the first mail box encountered. Those desiring a supply of these post cards should request them through the Washington office of their Division.

PHYSIOLOGY AND TOXICOLOGY OF INSECTS

J. W. Bulger, Takoma Park, Md., found phenothioxin toxic to culicine mosquito larvae at concentrations as low as 1 part to 500,000 parts of water. This compound is analogous to diphenylene oxide and diphenylene sulphide previously found to be very toxic to mosquito larvae.

D. E. Fink, Takoma Park, is studying the relative toxicity to mosquito larvae of tobacco extracts and nicotine sulphate of the same nicotine concentration.

M. C. Swingle and J. F. Cooper, at Sanford, Fla., are testing fixed nicotine dusts against newly hatched larvae of the imported cabbage worm (Ascia rapae L.), the greenhouse leaf tier (Phlyctaenia rubigalis Guen.), and the southern armyworm (Prodenia eridania Cram.). Of these three species, the cabbage worm is the most susceptible to nicotine. Nicotine silicotungstate again showed considerable toxicity to the armyworm.

F. L. Campbell and W. N. Sullivan, Takoma Park, have found that their laboratory method for testing kerosene sprays against house flies gives results in good agreement with those previously obtained with the same samples of pyrethrum-kerosene by others who used the Peet-Grady method. In the course of these tests they confirmed Melvin's report that male house flies are more susceptible to pyrethrum-kerosene sprays than are females.

EXCHANGE OF USEFUL INSECTS

G. J. Haeussler returns from Japan.--During the past 4 years Mr. Haeussler has been studying the natural enemies of the oriental fruit moth in France and Japan and has shipped large numbers of various species to the United States. During the past year he has also had charge of the investigations on Japanese beetle parasites in Japan. Upon his return to the United States in January he was assigned to the fruit moth parasite project at Moorestown, N. J. R. W. Burrell, of the Japanese beetle laboratory, will succeed him in charge of investigations of both pests in Japan.

BEE CULTURE

W. J. Nolan, of the Somerset, Md., laboratory, appeared twice on the program of the Rhode Island Beekeepers' Association on February 3 at Providence, R. I., during the Rhode Island Agricultural Conference. Notwithstanding bad weather, the beekeepers were well represented. There was a good exhibit of Rhode Island honey and beeswax.

On January 15 and 16 C. E. Burnside, Somerset, attended the Pennsylvania State Farm Fair at Harrisburg for the purpose of judging the apiary products. The Farm Fair is an exhibit of farm products and manufactured articles produced in the State of Pennsylvania and is held in the Farm Fair Building, the largest of its kind in the United States, having a floor space of about 10 acres. The apiary exhibits occupied two entire sections of this building and were divided into three groups: Exhibits of commercial beekeepers; exhibits of 4-H Clubs, under the direction of J. E. Anderson; and exhibits of vocational and agricultural classes of the public schools throughout the State. There were more than 100 exhibitors of apiary products,

consisting of comb honeys, extracted honeys, beeswax, honey candy, granulated honey, creamy honey, and honey vinegar. There was keen competition between the commercial beekeepers and the members of the 4-H Clubs, and a number of sweepstake prizes were taken by club members, although the greater number of such prizes went to commercial beekeepers. It was estimated that the attendance on Tuesday was between 70,000 and 80,000. The apiary products attracted much attention from visitors at the Fair.

While at Harrisburg, Mr. Burnside participated in the meeting of the Pennsylvania State Beekeeper's Association held on Jan. 16, 17, and 18. He showed the film strip, "Diagnosis of Bee Diseases in the Apiary," and gave a lecture explaining the symptoms illustrated by the pictures and upon which diagnosis in the apiary depends. He also gave a talk on the disorder of adult bees commonly known as "paralysis." The meeting was well attended, the room being filled throughout the entire session.

The United States Post Office Department has announced that tentative approval has been given for the use of the single-screen wire cage for shipping package bees through the mail, and orders to this effect have gone forward to postmasters at points where package bees are accepted for mail delivery. The Post Office Department wants it thoroughly understood, however, that approval is only tentative, and that the acceptance of single-screen wire cages in place of the double-screen wire cage is being instituted as an experiment, and that if the use of the single-screen cages is not successful the Department will order only the acceptance of double-screen wire cages. The use of the single-screen wire cages should increase package-bee business and permit the buyers to benefit through decreased prices.

The Railway Express Agency has asked the Bee Culture Laboratory to make an investigation of the causes of the losses of package bees in transit. Last year claims against the express company were unusually large, particularly from certain shippers. The shippers claim that the death of bees is caused by exposing the packages, enroute, to sunlight. On the other hand, the express company is rather dubious about this being the cause of the losses, as practically all points at which package bees are transferred from one car to another are under covered sheds. Some cooperative experiments in which the Southern States Bee Culture Field Laboratory will take a leading part are being planned to discover the cause of these losses.